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SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •

June 24, 1939

Heavenly Pyrotechnics

See page 395

A SCIENCE SERVICE PUBLICATION

Do You Know?

Britain has 13 million subjects in the Americas.

Japan has forbidden picture-taking near the Great Wall of China.

American pioneers learned to find water on their westward trek by following paths made by the buffalo.

More minerals have been taken out of the earth since 1900 than in all previous history, by conservative estimate.

When Alexander the Great plundered Persepolis in Persia, it took 20,000 mules and 5,000 camels to carry off the loot, so an historian declared.

The artificial lake formed by Parker Dam on the Colorado River has been named Havasu Lake, from the Mohave Indian word meaning "blue."

A new coating to make household fabrics water and sun-proof also renders the goods capable of being hemmed or seamed by pressing with a warm iron.

Government scientists are investigating 18 of the watersheds in the United States, to find out how land management in these areas might help control floods.

Chinese painting, sculpture, and probably Chinese music, all were revolutionized following the campaigns of Alexander the Great, due to Greek influences which spread eastward, says Prof. W. M. McGovern, historian.

QUESTIONS DISCUSSED IN THIS ISSUE

Most articles which appear in SCIENCE NEWS LETTER *are based on communications to Science Service, or on papers before meetings. Where published sources are used they are referred to in the article.*

AERONAUTICS

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BIOLOGY

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MEDICINE

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PHYSICS

Why are noble metals necessary to the unleasing of the atom's power? p. 392.

PUBLIC HEALTH—BACTERIOLOGY

What can you do to prevent human cases of horse sleeping sickness? p. 393.

Why should a dog suspected of rabies not be shot? p. 393.

Potatoes turn green from sunburn and are bitter and inedible.

The public is becoming more and more weather - conscious, the U. S. Weather Bureau finds.

Hill climbing ability of various trucks is being studied by the U. S. Bureau of Public Roads, with a view to improving highway design.

Near Santa Barbara, California, workers recently found a barbecue pit big enough for two steers, which was a relic of a Franciscan mission.

Artificially flattening or shaping the head has been a widespread custom among the world's people, from the days of ancient Egypt and Crete.

Natural color is used in a much greater percentage of amateur movies than in professional films.

Experiments with growing cinchona—source of quinine—in the Belgian Congo are reported successful.

Buenos Aires, capital of Argentina, is now the second largest city of the Americas, having a population of 3,304,000.

A runic stone indicates the presence of medieval European colonists 450 miles north of the Arctic Circle in Greenland.

The British government advises large factories to provide an air raid shelter for each 50 employees, so that if one refuge is hit, the personnel will not be wiped out.

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BIOLOGY

Tuberculosis Germ Produces Anti-Bleeding Vitamin K

Cause of Severe Bleeding Itself, It Nevertheless Gets Its Color From Anti-Hemorrhage Crystals

THE TUBERCULOSIS germ, often a cause of severe and fatal bleeding, may shortly give doctors a weapon against bleeding.

This surprising possibility of good coming from the White Plague seems promised by the discovery that the yellow crystals which give the TB germ its color are a form of vitamin K, called the anti-hemorrhagic vitamin because it prevents or checks tendency to fatal bleeding in obstructive jaundice.

The discovery, by Drs. H. J. Almquist and A. A. Klose of the University of California at Berkeley, is reported in the *Journal of the American Chemical Society*. (June)

Although the germs in the tuberculosis patient's body make this life-saving chemical which is both coloring matter and vitamin, the patient cannot get it from the germs that are making him sick and boring through his blood vessels to cause hemorrhage. Nor would it do him any good if he could, because lack of vitamin K is not the cause of hemorrhage in tuberculosis, and the TB patient does not suffer from lack of blood-clotting substance. Patients with obstructive jaundice, the ailment that turns the skin yellow, do suffer from lack of the blood-clotting substance because in their condition the flow of bile to the intestines is blocked. Without bile, the patient cannot absorb vitamin K from his food.

Fortunately, however, the chemical has been extracted from the TB germs and has ever been made synthetically by Prof. R. J. Anderson of Yale University, who christened it phthiocol. The California scientists used some of Prof. Anderson's synthetic phthiocol in their experiments.

"The compound has been definitely shown to be a form of vitamin K," they state.

It has physical and chemical properties similar to those known for vitamin K. Fed to chicks with a vitamin K-less diet, the synthetic TB chemical kept the clotting time of the chicks' blood from being dangerously prolonged just as vitamin K itself would.

"This discovery essentially completes the vitamin K problem," the California scientists state, adding that they believe phthiocol is probably the simplest member of an homologous series of anti-hemorrhagic substances.

Their discovery of its identity as vitamin K is considered an amazing outcome of the tedious and even dangerous chemical studies of tuberculosis germs which Prof. Anderson has been making for 10 years under a grant from the National Tuberculosis Association, made possible by Christmas seal sales.

Prof. Anderson believed when he discovered phthiocol that it was a stimulus to growth and might prove valuable some day if scientists could learn how to use it. Firm in this belief, he persuaded Yale University to patent his synthetic phthiocol. It has not yet been made commercially but probably soon will be, and is expected to be available at a low cost.

Soon after Prof. Anderson discovered phthiocol in TB germs, other scientists found it in other forms of life and it is believed to be fairly widely distributed throughout nature.

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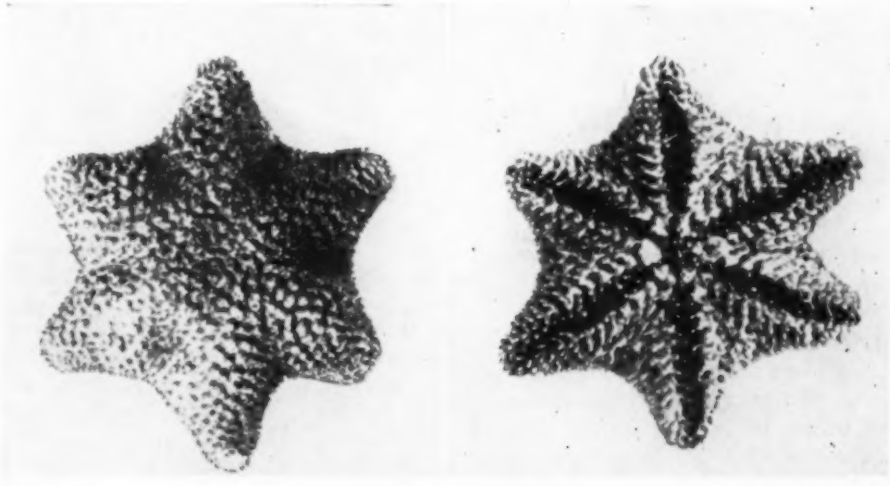
CHEMISTRY

Elements' "Fingerprints" In Gigantic Catalog

MILLIONS of "fingerprints" of the chemical elements, little lines in the spectrum of light, are being charted and listed under the direction of Prof. George Russell Harrison of the Massachusetts Institute of Technology to give science one of its most necessary and basic catalogs.

Design of machines which have made this work possible has won for Prof. Harrison the famous Count Rumford medal of the American Academy of Arts and Sciences to be presented this fall. Preparing the catalog is somewhat like compiling an unabridged dictionary, or the great fingerprint file of the Department of Justice in Washington. Its closest scientific counterpart is the Boss catalog giving the position and brightness of all stars in the sky down to 17th magnitude. But the catalog of spectral lines is even more important. It is a key to the basic stuff of which the universe is built.

Spectral lines have been listed and utilized from the middle of the last century when it was found that in Newton's



NEW STARFISH

We are accustomed to thinking of starfish as being always five-armed, but this is by no means necessarily the case. An interesting genus of very small starfish, recently described by Austin H. Clark of the U. S. National Museum, is symmetrically six-armed, as the above pictures show. The actual diameter of the specimen, from tip to tip, is a little less than one centimeter. The new starfish, first collected in the Aleutian islands by Dr. Victor B. Scheffer of the U. S. Biological Survey, has been given the name Aleutiaster schefferi.

rainbow of colors from light passed through a prism there are lines absolutely characteristic of the chemical elements producing them. Others have compiled famous lists of spectral lines, such as Rowland's measurements of all the solar lines. More recently Dr. W. F. Meggers of the National Bureau of Standards, with the collaboration of Dr. Henry Norris Russell of Princeton, a great authority on spectra, has compiled catalogs for numerous elements.

A tiny bit of an element placed in a flame or spark discharge can be instantly detected by its tell-tale spectrum as a result of such catalogs.

The great inclusive catalog at MIT is the result of Prof. Harrison's application of factory methods to the problem. The WPA has furnished skilled labor and funds to speed the task. Special machines were designed and built to reduce the labor and improve the accuracy of measuring microscopically the location of the "fingerprint" lines in photographs. Figures by the thousands are compiled to chart the results. First result is a publication containing about 100,000 of the strongest lines of all elements. Later will come complete catalogs.

Science News Letter, June 24, 1939

MEDICINE

Cancer-Producing Substance Found in Roasted Foods

CANCER-PRODUCING substances have been found in roasted foods, specifically in roasted horse meat, browned butter and roasted coffee. This discovery was made by Dr. E. M. P. Widmark of the University of Lund, Sweden. (*Nature*)

Whether eating roasted foods can cause cancer in man is not stated in Dr. Widmark's report of experiments with mice. Extracts of the roasted foods were painted on the backs of the animals' heads. None of the males developed cancers, but nine out of 23 females developed cancer of the breast.

The cancer-causing substances probably get into the animals' bodies through being swallowed, Dr. Widmark points out, because there was very little change in the skin where the extracts of roasted foods were applied, but the animals very quickly licked the substance off their skins.

Dr. Widmark is now trying to isolate the cancer-producing substances in roasted foods so as to learn what they are.

Science News Letter, June 24, 1939

MEDICINE

Largest Cancer Hospital Aids Patients in Remote Villages

New Ways of Fighting Dread Disease Are Being Developed And New Fighters Trained at New York Institution

CANCER patients in the big city of New York and in tiny hamlets thousands of miles from there will be helped by Memorial Hospital which opened the doors of its new, $5,000,000 building on June 14.

They will be helped even though they never cross the threshold of this, America's first and now the world's largest exclusively cancer hospital, and even though they never have rays from the hospital's new, pocket-edition million-volt X-ray machine trained on the malignant growths that are sapping their lives.

This is true because from this hospital every year there go forth young men trained to detect every variety of cancer, even in the earliest forms, and trained, also, to give the most effective cancer treatment known to science.

These young doctors, ready to devote themselves to the fight against cancer and picked for the ability they have already shown during hospital training, are given three and one-half years of special training in cancer-fighting under the Rockefeller research fellowships established at Memorial Hospital in 1925. Details of their training were told by Dr. Lloyd F. Craver, chairman of the fellowship committee, at the dedication and opening of the new hospital building.

These young men and additional fellows getting the same training at Memorial Hospital under grants from the National Advisory Cancer Council will not for some time to come constitute a large enough band of cancer-fighters to see all cancer patients throughout the nation. But patients the world over are getting other help from the activities of Memorial Hospital.

New ways of fighting cancer or improvement of old and tried ways, and new knowledge about cancer that might lead to its prevention are constantly being developed at the hospital. The new pocket-edition million-volt X-ray machine, described by Dr. William D. Coolidge, of the General Electric Company whose researchers developed it, is an example. Heretofore the benefit of these powerful and penetrating X-rays from million-volt machines had to be limited to hospitals or other institutions that could afford a building 62 feet long, 32 feet wide and 36 feet high to house it. In addition, many tons of lead were needed to protect operators and patients from the cumulative effects of the X-rays.

By improvements described by Dr. Coolidge, a pocket-size edition was developed for Memorial Hospital which can be housed in a grounded metal container four feet in diameter and seven feet long, and complete with its lead protection, this million volt machine, which is equivalent in radiation to $90,000,000 worth of radium, weighs about 4,000 pounds including about 1,000 pounds of protecting lead. Many hospitals which could not afford a special building for giant X-ray machines can find room for such pocket-size giants of cancer-killing power.

Very few persons, if they get cancer, are able to avail themselves of the best opportunities for diagnosis and treatment, Dr. Ludvig Hektoen, executive director of the National Cancer Advisory Council, stated at the dedication.

Even self-supporting persons in the moderate income brackets, Dr. Hektoen said, cannot meet the cost by their own means. In large areas of the country, moreover, adequate centers for diagnosis and treatment of cancer are not available.

To meet the needs of the people, cooperation between public and private agencies is necessary in Dr. Hektoen's opinion.

Science News Letter, June 24, 1939

RADIO

Dr. Reuben T. Shaw, president of the National Education Association, will be the guest scientist on "Adventures in Science" with Watson Davis, director of Science Service, over the coast to coast network of the Columbia Broadcasting System, Monday, July 3, 5:45 EDST, 4:45 EST, 3:45 CST, 2:45 MST, 1:45 PST. Listen in on your local station. Listen in each Monday.

AERONAUTICS

Smooth Flight Takes Thrill Out of Transatlantic Hop

Science Service Aviation Writer Finds Use of Clipper For Troop Ship Would Be Economical in Wartime

By LEONARD H. ENGEL

(Mr. Engel was one of 12 reporters on the Atlantic Clipper flight leaving America June 17)

SPANNING the Atlantic Ocean in eleven minutes less than 24 hours is a thrill. But it's mental rather than physical. You have to stop and think before you realize its significance.

Maybe the press preview flight is pioneering but if it is find me a new frontier, for this has been the smoothest flight any correspondent ever had.

Pan American Airways, operators of this huge, graceful flying boat, will put in their future file the suggestion of some of the women correspondents aboard; that the next edition of the clippers have a dance floor. That's how smooth the flight has been.

While 3,000 horsepower from the four giant engines hurled us through the night the soundproofing in the Atlantic Clipper's cabin was so good that to get "background" for a broadcast en route the radio men staged the show in the news room of the plane with a half dozen typewriters of correspondents clicking away. The drone of the engines was too faint to give good pickup.

Sea air's famous sleep-inducing qualities get you even at 8,000 feet above the sea, which was the altitude of the 41-ton Atlantic Clipper of Pan American Airways most of the way across. An air of distinct sleepiness, which we newspaper reporters aboard had to fight, pervaded the luxurious passenger quarters of the great flying boat.

Speeding along at 180 miles an hour, a 35-mile-an-hour tail wind gave the press preview flight a ground speed—or water speed one perhaps should say—of about 200 miles an hour.

Transport Record Set

THE Atlantic Clipper carried 30 people in all, the most ever to make a crossing in a plane at the same time. The record will be eclipsed next week, however, because heavy radio equipment now aboard for carrying broadcast descriptions of the flight for two nation-wide networks will not be aboard and there will be room for more people.

The present 30 include 12 members of the crew, two Pan American observers, four radio men and 12 newspaper correspondents. The previous record was 21, set on the Yankee Clipper, a sister ship, shortly before regular transatlantic airmail service.

Mechanics of the Flight

TWO hundred instruments, knobs, buttons, switches and gadgets; twelve crew members; 56 black steel cylinders; and other parts without number functioned perfectly on board the Atlantic Clipper so that it might alight with the lazy grace of a gull on the River Tagus at Lisbon, Portugal, at the end of a less-than-a-day journey from New York, 3,547 miles away.

Just about 3500 gallons of gasoline went out the red hot exhaust pipes of the Clipper's four giant engines, each rated at 1500 horsepower for takeoff and operated at about half that for regular flight. And, just to get technical for a second, that good red ethylated fuel gave up more than 110,000,000,000 foot-pounds of useful work, plus a lot of energy our engineers have not yet figured out how to capture.

The automatic pilot, the gyroscopic robot which steers a truer course than any human, was at the helm for about 60 per cent. of the trip, Capt. William B. Culbertson said. It is the device that is at the helm most of the time airliners are in the air.

Various young men in Baltimore and in Port Washington sat patiently at glass-topped tables with big maps of the Atlantic on them, and sheets of tracing paper pasted down over the track the big Boeing boat followed. Every half hour their pencils worked to mark down the ship's position, wind velocity and direction, the plane's speed and other data which enabled the flight watch to locate the clipper within a half mile of its exact spot at any time.

On the flying boat itself there are a pair of magnetic compasses, a pair of gyroscopic compasses, a couple of special octants for shooting the sun or the stars in a hurry in standard aerial navigation procedure, a drift sight to show wind direction and various other instruments to enable such accurate position finding, as well as radio direction finders so accurate they could almost locate a needle in an ocean, if the needle had the proper radio equipment.

Every so often a flight engineer took a walk through the wings and looked at an engine like a doctor at a patient. But the four engines were healthy and very little tinkering was called for. Minor repairs could have been made in flight, for the engines are accessible through a catwalk in the wings. There is room enough in each of the nacelles for four men to work.

Could Be Troopships

WHILE coming over on this history-making flight to Europe which previews the start of regular transatlantic service on June 28, I've learned that in the same time and at the same cost in equipment, a fleet of overseas flying boats like the Atlantic Clipper could carry more than three hostile soldiers from Europe to the United States for every two soldiers carried by troopship, World War Style.

For $17,000,000, which is the cost of the largest ship ever built in the United States, the *S.S. America* now under construction at Newport News, Va., 35 of these 41-ton clippers could be built.

Under wartime conditions each of these flying boats could make four roundtrips during the two weeks the *S.S. America* would need to make a single crossing of the Atlantic and return.

Stripped of their furnishings and generally cleared for mass ferry service, the Clippers would carry about 45 or 50 men each. Estimated conservatively, the total soldiers transported by the 35 planes in the two weeks of flying would be more than 6,000.

The *S.S. America,* whose normal passenger capacity will be 1,219, would be able to carry a little more than 4,000 soldiers in these same two weeks.

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Earthquakes that originate as deep in the earth as 400 miles have been recorded.

ASTRONOMY

Mars Comes Near

Visible Low in the Southeastern Sky Just After Dark Is the Ruddy Planet, Nearer Now Than Since 1924

By JAMES STOKLEY

LOOK to the southeastern sky this evening after it is quite dark. Down near the horizon, if it is clear, you will see a brilliant red orb, more brilliant than any star that is visible. This is the planet Mars, which is making the closest approach to the earth since 1924. On July 27 it will be at a distance of 36,030,000 miles which, astronomically speaking, is right next door.

But another planet is also visible in July, though much harder to find, and not nearly as brilliant as Mars. Low in the west just after sunset, for a day or two about July 14, Mercury will be on view. As it sets about an hour after the sun, before the sky is completely dark, it is necessary to look for it in the twilight.

Planets are bodies similar to the earth, revolving about the sun, shining by the sunlight they reflect. The other objects we see overhead at night, except the moon, are stars. These are distant suns, millions of times farther away than ours, and hence far less brilliant. They have the same position that they had this month last year, and as they will in July, 1940. On the map is shown their aspect as at 10:00 p. m., standard time, on the first of the month.

Easy To Find

Probably Antares is one of the easiest stars to find, for it is directly south, and to the right of Mars, standing in the constellation of Scorpius, the scorpion, whose hook-like tail curves around to the left. But even brighter than Antares is Vega, of Lyra, the lyre, which is to the east, almost overhead, and the most brilliant star now seen. Below Lyra is Cygnus, the swan, otherwise called the "northern cross." The cross is on its side, and Deneb, the brightest star of the group, is to the left. A little below and to the right of the other end of the cross is Altair, in Aquila, the eagle. These three—Vega, Deneb and Altair—form a large triangle in the eastern sky which is a good figure to know if you want to be able to find your way among the constellations.

All the stars mentioned are of the first magnitude, the astronomers' brightest class. Two others of this brilliance are also now in the sky, and they can easily be located from the familiar great dipper, which hangs to the northwest. The pointers, now the two lowermost stars of the dipper, are well known as guides to the pole star, or Polaris, but this is of the second magnitude. However, if one imagines the curve of the dipper's handle extended to the southwest, it leads to Arcturus in Bootes, and then to Spica, in Virgo, the virgin, the two referred to above.

Others Later

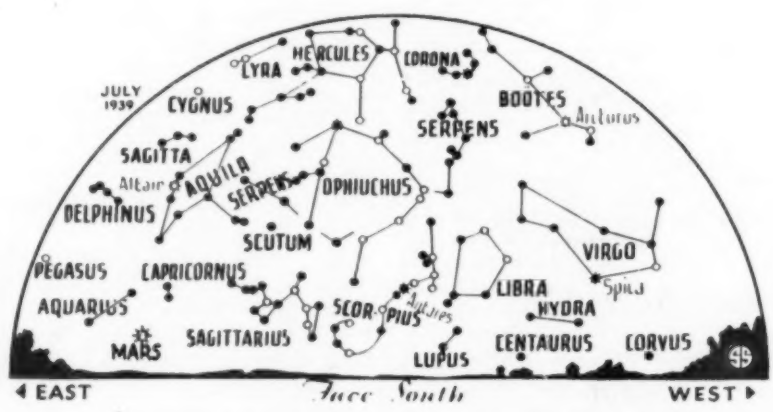
Later in the night other stars and planets can be seen. A little before midnight Jupiter comes into the sky, in the southwest, not far from the place we saw Mars a couple of hours before, and nearly as bright. It stands in the constellation of Pisces, the fishes. And soon after midnight, Saturn, considerably fainter, in the group of Aries, the ram, shines in the same general direction. The planet Venus is now in Gemini, the twins, but rises so soon before sunrise that it can hardly be found.

If men from Mars had intended to invade the earth, this is the month they would have done it, not last October. Then Mars and the earth were several times farther apart than they are now, and the journey would have been far more hazardous. The distance between our two planets varies enormously. When we are on opposite sides of the sun, we are separated by some 234,000,000 miles. On the average, when we are both in the same direction from the sun, we are nearly 49,000,000 miles apart. But the path of Mars is not nearly as circular as ours. The earth never varies more than about 1,500,000 miles tion as the earth from the sun, or in of 93,000,000 miles. Mars, on the other hand, has a very elliptical orbit. It can be as close to the sun as 128,500,000 miles, or as far as 154,500,000 miles. Thus, when Mars is in the same direction as the earth from the sun, or in "opposition," as it is called, we can be nearly 63,000,000 miles apart. But if the opposition happens to occur when Mars is nearest the sun, as it did in 1924, that planet is only 34,600,000 miles away from the earth.

Not For Years

This year conditions are not as good as they were then. As a matter of fact, the 1924 approach will not be repeated for centuries. But this year brings the best since then. On July 1, Mars is 40,800,000 miles away. On July 27 we are closest, with 36,030,000 miles. By August 1, Mars will have receded to 36,100,000 miles, and will continue drawing away until next year, when it will start approaching again. In 1941 will come the next opposition, which will be as favorable as the present one, but not until 15 years later will another one come that will be as good.

Naturally, this summer will see many observatories turning their telescopes on



SYMBOLS FOR STARS IN ORDER OF BRIGHTNESS

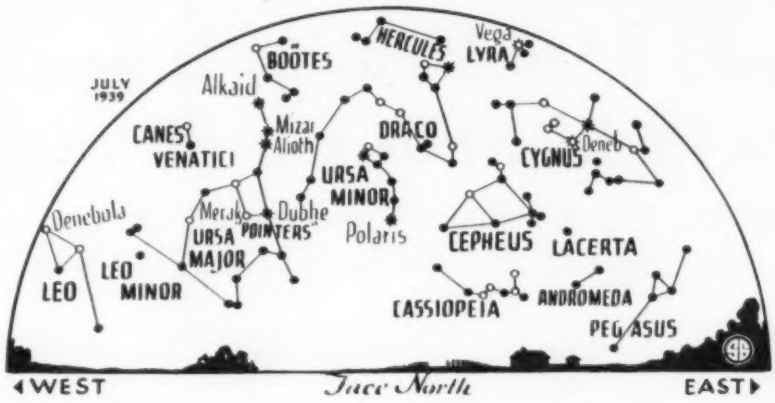
Mars, trying to solve some of its problems. Especially will this be true at the Lowell Observatory, in Flagstaff, Arizona, which has long specialized in planetary studies. Perhaps more will be learned about the elusive markings called "canals." These are peculiar lines that seem to cross the planet's surface, and which are real canals, according to the theory propounded by the late Prof. Percival Lowell. He believed that a race of superintelligent Martians, finding their water supply becoming exhausted, built this elaborate network to bring water from the melting ice of the poles to warmer parts of the planet. Today very few astronomers hold to this idea. Indeed, some think that the so-called canals are only optical illusions, that there are no such markings there at all.

Observations, made this year may help settle the controversy. If not, perhaps the opposition of 1941 will, for then the new 200-inch telescope of the California Institute of Technology will be in operation. Many reliable and expert observers have reported seeing the markings, but no entirely convincing photographs of them have been made. This is because the air, through which we must look at the planet, is continually in motion. The experienced observer occasionally gets momentary glimpses of fine detail, but the photograph, requiring an exposure of several seconds, is blurred.

The 200-inch telescope will gather about five times as much light as the largest telescope now existing, which means that shorter exposures can be given. Hence, the astronomers hope that the new instrument will allow them to photograph everything they can see, in the case of fairly bright objects, like the moon and the planets. If this hope is justified, the year 1941 may see one of the long standing problems of astronomy solved.

Celestial Time Table for July

Saturday, July 1, 11:16 a. m., Full moon. **Monday, July 3,** 5:56 p. m., Moon passes Mars. **Wednesday, July 5,** 9:00 a. m., moon farthest away, at 252,000 miles; 3:00 p. m., earth nearest sun for 1939, 94,452,000 miles distant. **Sunday, July 9,** 12:58 a. m., moon passes Jupiter; 2:49 p. m., moon at last quarter. **Monday, July 10,** 6:58 p. m., moon passes Saturn. **Thursday, July 13,** 2:00 p. m., Mercury farthest east of sun, visible in west at evening twilight. **Sunday, July 16,** 4:03 p. m., new moon; 11:12 p. m. to midnight, all four bright moons of Jupiter invisible, one in front of planet, another behind it, and two in its shadow. Jupiter only visible at this time in eastern part of the country. **Monday, July 17,** 6:00 p. m., moon nearest earth, 223,200 miles away. **Tuesday, July 18,** 1:35 p. m., moon passes Mercury **Saturday,**



July 22, 7:45 p. m., Spica hidden by moon —visible in N. E. United States. **Sunday, July 23,** 3:00 a. m., Mars in opposition; 6:34 a. m., moon in first quarter. **Thursday, July 27,** 4:00 p. m., Mars nearest earth—distance 36,030,000 miles. **Friday, July 28,** early morning. Meteors of delta Aquarid shower visible. **Sunday, July 30,** 11:13 a. m., moon passes Mars. **Monday, July 31,** 1:37 a. m., full moon. (Eastern standard time throughout)

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ENGINEERING

"Liquid Coal" Claimed to Be More Economical Than Gas

Specially Prepared Coal Ground to 300 Mesh Was Suspended in Gasoline or Oil to Run Motor After Start

FORESHADOWING a time when man's immense coal resources, which far outstrip other sources of power available at present, may be put to work in the automobile in place of gasoline, a stock car changed only in one minor respect made a first demonstration run on a new fuel, "liquid coal."

Made of finely pulverized coal suspended in an oil "carrier," the new fuel, whose development has attracted the attention of scientists and engineers during the last twenty years, has enabled the car, an eight-cylinder 1939 sedan, to accelerate up to 35 miles an hour within a block.

Applied to a standard automobile by Dr. Francis W. Godwin, director of the coal research division of the Armour Institute of Technology's research foundation, the fuel is more economical than gasoline although the cost per gallon is about the same, because it contains far more energy.

Neither the carburetor nor the ignition system of the car was changed in any way. One fine-screened filter was removed from the fuel system to accommodate the colloidal fuel, Dr. Godwin said.

(Because coal itself is essentially inconvenient to handle and bulky, scientists have been trying to devise a workable "liquid coal" such as this for many years. Thus far, however, it was stated in Washington, all such fuels have been impossible to use economically in an internal combustion engine because of the ash which coal leaves and which causes great wear and tear on the moving parts of the engine. It is not known whether the new development has overcome this difficulty.)

"Three different types of liquid coal have been successfully used in the tests on the stock model automobile," Dr. Godwin said. The first was a suspension of a specially prepared coal ground to 300 mesh in a mixture of gasoline, fuel oil and lubricating oil. The second was a similar suspension of the coal in a Diesel oil. The third test was made with a very light oil. In each case, the liquid coal was chemically stabilized to hold the coal in suspension.

The demonstration car was started on gasoline. The liquid coal was fed to the motor from an auxiliary tank after the motor had reached "driving heat."

The fuel can be marketed for about ten cents a gallon, Dr. Godwin declared. He foresees its most immediate automotive usefulness in the Diesel field.

Science News Letter, June 24, 1939

PHYSICS

Gold May Help to Unleash The Hidden Power of the Atom

Apparatus Worth a King's Ransom Made of Platinum or Gold May Separate Uranium Isotopes as a First Step

APPARATUS worth a king's ransom and made of pure platinum or gold may be used by scientists to prove definitely whether or not uranium atoms can be split and used as a practical source of atomic power.

Equipment costing from $50,000 to $100,000 might find the answer. Fantastic though such costs would be, the price would be worthwhile if a new kind of power source could be created.

You and your descendants may never use atomic power in your home but it may some day be the potent and compact driving force behind the flights of trans-oceanic airplanes and long-distance bombing planes. If practical uses of this nature can be developed they will come inevitably, for in warfare all costs are thrown out the window if the end result is a military weapon more effective than anything which has come before.

So far it appears that there is not much hope of obtaining atomic power in usable amounts from ordinary uranium. However, power from the rarer kind of uranium having mass 235 instead of 238 is still a possibility. Gold and platinum apparatus will be needed to tame the only kind of uranium compound which—at present—appears to offer the chance of yielding this rarer isotope.

The two isotopes of uranium are intermixed in natural sources. The present theory (yet unproved) of uranium's fission is that it is the rare uranium 235 which can be split in a chain-reaction that might—conceivably—become self-sustaining and be useful as a source of atomic power.

So rare is uranium 235 that enough of it has not yet been gathered in one spot to perform this astounding, historic experiment of attempting to make it keep splitting itself, with each atom releasing large amounts of atomic energy.

Gold and platinum apparatus must be used because the methods of separating isotopes so far developed work best for gases. The only gaseous compound of uranium is corrosive, deadly uranium hexafluoride which would destroy any apparatus not made of the noble metals.

Right now it appears that the creation of atomic power from uranium's splitting is nip and tuck. If a gram of uranium with mass 238 "burns" it liberates 2,500,000 times as much energy as a gram of coal.

If it is only the rare uranium isotope of mass 235 which "burns"—as now appears probable—then one must divide this figure by the ratio of the isotopes: 140.

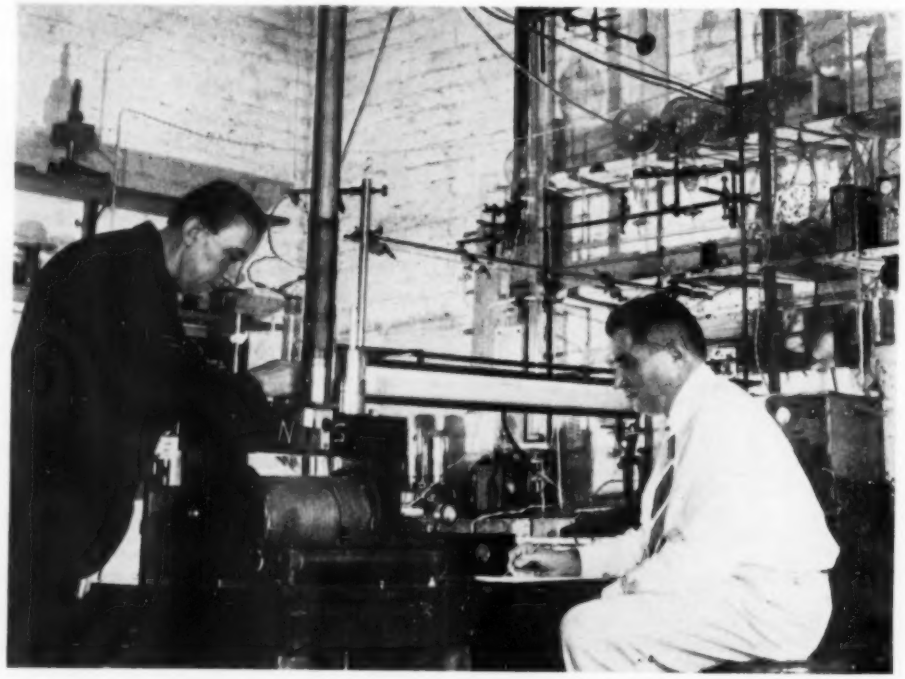
This leaves an energy preponderance in favor of uranium over coal of only some 17,800 times. Current prices for uranium oxide are about $2.00 a pound while coal at the mines is about $2.00 a ton.

Thus if uranium of mass 238 will burn the system perhaps is feasible, if scientists can figure out how to create and control it. If it is uranium 235 which is needed, however, there is probably not enough uranium in the world to do the job. Present production of uranium in the United States is only 50 tons a year while coal is produced at about 500,000,000 tons a year.

At present scientists in France have reported that for each atomic particle (neutrons) sent into uranium they are able to liberate three neutrons. This means that they potentially have the means of perpetuating a chain reaction. Better measurements in America—and figuring all processes more conservatively—show that the figure is little better than one for one. The present experiments are crude and the experimental errors large so that definite answers are difficult to obtain.

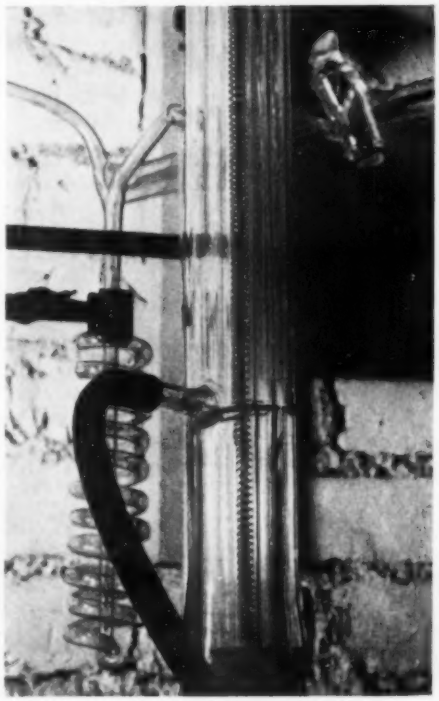
However, looking into the future, Drs. F. Adler and H. Von Halban, Jr., of the nuclear chemistry laboratory of the College of France, Paris, have just reported a means of controlling the atomic power once it has been liberated.

The French scientists suggest that cadmium be placed in the system so that the neutrons will be properly slowed down. From theory they calculate that the system should come to equilibrium at a temperature which would be characteristic of the chemical composition of the uranium products used and with the size of the system.



ISOTOPE "SEPARATOR"

Dr. Arthur Bramley (left) and Dr. A. Keith Brewer, of the U. S. Bureau of Chemistry and Soils, who developed this apparatus for the thermal diffusion method of isotope separation.



HEART OF APPARATUS

This tube which extends ceiling-high in the apparatus on page 392 is where the separation takes place. The tiny inner tube is heated by the coil of wire while the outer tube is cooled by water entering through the black tubing. The temperature difference sets up a swirling of gases causing the separation.

Their scheme—a pioneer method yet untried—may some day correspond to the "drafts and dampers" on a furnace which keep coal burning steadily and under control.

While the French have thus publicly mentioned a scheme which has been in the minds of many other scientists in America—but yet unreported because it seemed ill-advised in the present preliminary stage—there has been a strange and perhaps ominous silence on such matters from Germany, the land where the original discovery of uranium's splitting was made last summer.

Perhaps, the keen resources of Germany's regimented scientists are even now at work pushing the exploitation of uranium's splitting—and its release of atomic energy—for military purposes.

The worries of Americans on this point are real for two reasons. One, the original discovery was made in Germany and enabled them to get a "jump" on the rest of the world if they wished to do so. Two, one of the best methods of separating isotopes is German-made; the method of Clusius on thermal diffusion.

This Clusius method is now exhibiting promise in America on a tiny experimental scale but it is well-known and long-tried in Germany.

All of this is, of course, conjecture. However, it does have considerable scientific possibility. Indeed there is so much that is true mixed with what may amount to mere speculation that American scientists are pushing their uranium research diligently to learn, at least, whether atomic power can be obtained in a safe and reasonable form.

Science News Letter, June 24, 1939

PUBLIC HEALTH—BACTERIOLOGY

Advise Precautions Against Horse Sleeping Sickness

Control of Rabies, Yellow Fever, Typhus and Rocky Mountain Fever Also Discussed at Virus Meeting

EQUINE encephalomyelitis, or horse "sleeping sickness," for years of great economic consequence in the livestock industry, has become an outstanding public health problem with the discovery during the past year that man can contract this horse disease, Dr. Leroy D. Fothergill of Harvard University told the Harvard virus symposium.

The first important control measure, he said, is to use a very effective horse vaccine which has been developed in an effort to eradicate the disease from horses. To prevent its spread among humans, he urged screening against the mosquito carriers. Man could be vaccinated against the disease, he said, but the low incidence does not warrant this now.

Despite this low incidence, however, he urged care, for few viruses are capable of causing infection in such a wide spectrum of different species. The discovery last year by Dr. Fothergill that birds may also have the disease complicates the epidemiology. Primarily a summer and autumn disease, it attacks children more often than adults.

Don't Shoot the Dog

DON'T shoot a dog suspected of being rabid unless necessary for protection. Instead, capture and quarantine it under observation for a 10-day period. This advice on the control of rabies or hydrophobia was given by Lieut. Col. Raymond A. Kelser, chief of the U. S. Army Veterinary Corps.

If the dog is killed it is often impossible to tell if it had rabies and diagnosis of the disease in man is possible only through diagnosis of the biting dog. When man shows the symptoms of the disease, it is too late for the Pasteur treatment, which must begin within four days of the bite to be effective. Bites about the head and face, he recommends, should be treated at once if the dog is suspected, and the dog quarantined. Treatments can be discontinued if the dog proves well.

For control measures, Col. Kelser urged quarantine of imported dogs, restraining of dogs in an infected community and prophylactic immunization against rabies as an adjunct, not a substitute, to these measures.

He said the danger of the disease was often overemphasized and that while treatment should be given in definite cases, its use to "play safe" was not always advisable.

Yellow Fever Control

AT LAST medicine is in a position to control jungle yellow fever in South America and some advance can be made in Africa, the other great focus of this disease, Dr. Frederick F. Russell, professor emeritus, Harvard University, reported.

Dr. Russell emphasized that control in South America may be more im-

MIRACLES LIKE

BURBANK'S

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portant to the United States than is realized for the southern states have the carrying mosquito and, while no recent cases have been reported, there is always the danger of an outbreak, particularly with modern transportation facilities to aid the spread.

Control in South America, he said, is possible through use of a recent and very effective vaccine, made from attenuated virus, which seems to confer a fairly lasting immunity. Over a million vaccinations have been carried out thus far with very encouraging results. Mosquito-control projects are also used.

Information concerning the African problem is still inadequate and control will be slow, but Dr. Russell said some advance can be made each year.

Rickettsial Diseases

PROGRESS toward control of the rickettsial diseases, typhus fever and Rocky Mountain spotted fever, was reported to the virus conference at Harvard Medical School by Dr. Hans Zinsser of Harvard.

The most encouraging method, he said, is the use of killed typhus virus for immunization. The use of living virus and a combination of living virus and antiserum for vaccination, he emphasized, are dangerous and should not be attempted until the use of killed material has been fully explored.

The major problem with the use of killed material is that large amounts must be employed but with the recent amazing progress in culture methods, this problem seems well on its way to solution.

While passive immunity, because of its temporary nature, is incomplete as an answer to the control problem, Dr. Zinsser reported, the serum of immunized horses has been proved to have specific protective, prophylactic and therapeutic action against typhus fever in Mexico.

Would Prohibit Parrots

ABSOLUTE prohibition of the importation of any birds of the parrot family and rigid regulation of domestic stock, with destruction of infected birds, was urged by Dr. John F. Enders of the Harvard Medical School as offering the best hope of safeguarding man against the parrot disease, psittacosis.

Such a program would require strict enforcement of existing laws on bird control, a few new ones, and close cooperation among public health officials, bird dealers and the public, he said, but it would be well repaid by the stamping out of a disease which despite the fact that it is easily preventable, constitutes a definite public health menace.

The most insidious feature of the disease is that apparently well birds may carry the disease and pass it on to man. The familiar green parrot of Brazil and the Australian parrakeet are the worst offenders in this respect but canaries, finches, sparrows and even young chicks are susceptible to the disease.

The problem of immunizing against the disease is not yet fully understood, Dr. Enders reported. Some success has been had with inoculations to produce mild cases of the disease, however, and the use of immune serum may also be possible after further research.

Science News Letter, June 24, 1939

PHYSICS

Search for Elements Heavier Than Uranium Unsuccessful

THE INTRIGUING picture of scientists being able to create super-heavy chemical elements by the bombardment of uranium with neutral atomic particles, the neutrons, apparently is now proved impossible by elaborate and careful experiments performed by the Italian physicist, Dr. Emilio Segrè, working at the radiation laboratory of the University of California.

Describing his results in *Physical Review*, (June 1) Dr. Segrè concludes that "transuranic elements have not yet been observed."

Such elements more massive than uranium—heavyweight of all chemical elements—were suggested by the 1934 experiments of the Nobel Prize scientist Prof. Enrico Fermi of Rome, who is now at Columbia University. Dr. Segrè was one of the research group which worked with Prof. Fermi in these earlier experiments.

By bombarding uranium with neutrons, Dr. Segrè found that the well-known radioactive isotope of uranium—having a half-life of 23 minutes—was produced. This isotope disintegrated with the emission of an electron, a so-called beta particle. A search for alpha particle emission was unsuccessful.

While he was not able to demonstrate its presence chemically, Dr. Segrè concludes that the beta emission means the isotope breaks down into element 93, which is extremely long-lived. This is in keeping with the present picture of radioactive disintegration, but furnishes only very indirect proof, and makes true Dr. Segrè's conclusion that transuranic elements have not yet been observed.

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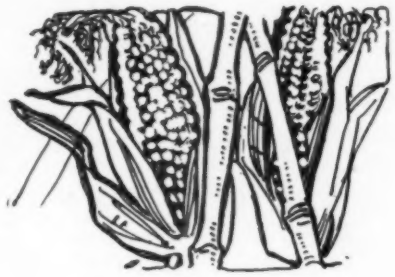
BOTANY

NATURE RAMBLINGS
by Frank Thone



Seeking an Ancestor

CORN'S wild ancestor has never been found. Perhaps the plant is extinct, perhaps it still lurks in some unexplored mountain valley in Central or South America, or on the inaccessible lowlands on "the wrong side of the Andes." Just the off chance that the wild form of this most important of the world's food plants may yet be found is sufficient spur to drive explorers—and to stimulate armchair speculation.

If you were looking for corn's surviving ancestor, where would you do your searching? A hint may be found in the kind of terrain now demanded by the corn crop. Corn insists upon the cleanest kind of cultivation, which means soil kept constantly stirred and loose. Giant though it is among plants, it cannot successfully compete with crowding weeds or contend with hard, packed soil.

Where in nature will you find the nearest approximation to the soil of a well-cultivated cornfield? Clean, freshly exposed soil surfaces are found primarily in two kinds of locations: on newly eroded surfaces, such as are provided by landslips and caving gullies, and on thick deposits of silt left by receding floods, smothering down the previously existing vegetation.

Flood-deposited mud seems a bit too dense and heavy for corn, although we must keep in mind the likelihood that our hypothetical ancestor-plant, like the wild ancestors of practically all domesticated plants and animals, will be considerably tougher and more adaptable than its specialized, "soft" descendant.

Scars left by mountain landslides are not much more promising than river-bottom muds. The soil there is apt to be either rough gravel or raw clay, inhospitable to any kind of plant life.

The loose, moist, but well-aerated soil left by the caving sides of gullies in alluvial soil would seem to be the nearest natural approximation to the artificial conditions of a modern cornfield. Perhaps such spots would offer the best chances for finding possible survivors of the original wild-type *Zea mais.*

Science News Letter, June 24, 1939

MEDICINE

24-Hour Recoveries Result From Synthesized Vitamin

DRAMATIC, 24-hour recoveries of human patients after treatment with the newly-synthesized pure vitamin B_6 are announced by Drs. Tom D. Spies, William B. Bean and William F. Ashe, of Birmingham, Ala. (*Journal, American Medical Association,* June 10)

This is the first time, it is believed, that human use or need for this part of the vitamin B group has been reported. Rats, it was known, needed the vitamin to prevent skin disease. Synthesis of the vitamin was reported just a short time ago (April 14) by Drs. Stanton A. Harris and Karl Folkers of Merck and Company's Research Laboratory.

Four persons who had been treated for pellagra and beriberi, due to lack of two other B vitamins, developed symptoms again when they went back to their old inadequate diets. A small amount of pure synthetic vitamin B_6 was given them. Both doctors and patients were astounded when within 24 hours all their symptoms had disappeared.

One man had been able to walk only a few steps when given an injection of vitamin B_6. The following day he walked two miles without fatigue.

Vitamin B_6 is one of the water-soluble compounds of the vitamin B complex and is a component of yeast and liver extract.

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METEOROLOGY

Superb Lightning Picture Snapped in Yellowstone

See Front Cover

IT MAY BE at least minor treason to mention it, but it isn't always fair weather in America's No. 1 vacation spots, the national parks. However, even storms may add to the beauty and grandeur which we go out into the wilderness to see, as witness the superb lightning display caught in the Yellowstone by the camera of J. E. Haynes and shown on the front cover of this week's SCIENCE NEWS LETTER.

Science News Letter, June 24, 1939

MEDICINE

Vaccine to Guard Men From Horse "Sleeping Sickness"

A VACCINE is now ready to protect humans against horse "sleeping sickness" if there is an outbreak this summer as there was last year. Development of the vaccine is announced to fellow scientists by Dr. Ralph W. G. Wyckoff, of the Lederle Laboratories at Pearl River, N. Y., (*Science,* June 9).

Vaccines that protect horses against both eastern and western types of this serious plague have previously been developed, but medical and health authorities did not consider these suitable for human use. Dr. Wyckoff's vaccine has been prepared in a somewhat different way from that used for making horse vaccines.

It has been effective in protecting laboratory animals and should, Dr. Wyckoff says, "be more suitable for any human use that may in the future be needed."

Reported cases in the outbreak of the horse plague among humans in Massachusetts last summer totaled 38. A few cases were also reported in the West.

Science News Letter, June 24, 1939

ELECTRON OPTICS

Compiled by

Otto Klemperer

A NEW VOLUME IN THE
Cambridge Physical Tracts

$1.75

This book deals with the recent rapid development of the theory and applications of electrostatic and magnetic "lenses", particularly in television and microscopy. It is intelligible to readers who have not specialized in electron optics; it describes the important principles of the science as well as the methods of research and present practical applications.

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•First Glances at New Books

Entomology

OF ANTS AND MEN—Caryl P. Haskins—*Prentice-Hall,* 244 p., illus., $2.75. Ever since Solomon, scholars have been admonishing us to go to the ant to learn wisdom. This latest entry in that oft-worked field shows that the last word has by no means been said. Descriptions of the ants' ways of life are instructive, especially to the non-biological reader, and the social morals drawn from analogies between the formicine race and our own are always provocative even where one must register dissent.

Science News Letter, June 24, 1939

Biology

PRINCIPLES OF DEVELOPMENT — Paul Weiss—*Holt,* 601 p., $5. Students of embryology and experimental morphology will welcome this book, both for inclusiveness in topics and for the carefulness and detail of the treatment.

Science News Letter, June 24, 1939

History

THE EARLY EMPIRES OF CENTRAL ASIA — William Montgomery McGovern — *Univ. of North Carolina Press,* 529 p., $4. Scythians and Huns are all but missing links in the average appraisal of world history. Prof. McGovern adeptly fills the gap in this first book ever to tell the whole story of Central Asia from prehistory down to the sixth century A. D. It is readable history, as well as a scholary production.

Science News Letter, June 24, 1939

Natural History

ANNUAL REPORT OF THE DIRECTOR TO THE BOARD OF TRUSTEES FOR THE YEAR 1938—*Field Museum of Natural History,* 474 p., $1. (Report Series, Vol. XI, No. 3)

Science News Letter, June 24, 1939

Engineering

WATER POLLUTION IN THE UNITED STATES—National Resources Committee *Govt. Print. Off.,* 165 p., 25c. This bulletin, though not large, offers a comprehensive view of the pollution problem as it now exists in the United States, outlines remedial steps taken during the past half-dozen years, and points out necessary next steps.

Science News Letter, June 24, 1939

Biology

PHYSIOLOGICAL GROUP DIFFERENTIATION IN LYMNAEA COLUMELLA—Joshua L. Baily—*Johns Hopkins Press,* 133 p., $1. (The American Journal of Hygiene Monographic Series, No. 14, April, 1939). Under apparent morphological identity there often lurk wide diversities in physiology, as has been demonstrated in various practical ways for such widely separated organisms as men and microbes. Dr. Baily has made a critical study of this phenomenon, using a widely distributed species of pond snail as "test animal" and applying modern quantitative and statistical methods.

Science News Letter, June 24, 1939

Geography

• ROMANCE OF THE NATIONAL PARKS—Harlean James—*Macmillan,* 240 p., $3. A rapid conspectus of all the parks in the U. S. National Park System, with something of the story of the men who originated and developed that system, and above all hundreds of striking and beautiful photographs. It could not appear more opportunely than now, when the summer travel season is getting under way.

Science News Letter, June 24, 1939

Library Science

UNION LIST OF SCIENTIFIC PERIODICALS IN THE CHEMICAL LIBRARIES OF THE CHEMISTRY SECTION, SCIENCE-TECHNOLOGY GROUP OF THE SPECIAL LIBRARIES ASSOCIATION, 1939, 2nd ed.—Betty Joy Cole, rev.—*Special Libraries Association,* 77 p., $2.50. Approximately 1,000 scientific periodicals are listed, with the location of sets in 68 special libraries. Considering that the holdings of few of these libraries are listed in Wilson Company's "Union List of Serials", it is evident that this list opens up great possibilities to research workers in science and librarians who are unable to locate periodicals in the larger libraries of the neighborhood.

Science News Letter, June 24, 1939

Astronomy

THE SPECTRUM OF NOVA AQUILAE (1918)—Arthur B. Wyse — *Univ. of Calif.,* 215 p., $2.25. The technical history of a famous star that flashed to temporary brilliance.

Science News Letter, June 24, 1939

Anthropology

PETROGLYPHS OF NORTH CENTRAL NEW MEXICO—E. B. Renaud—*Dept. of Anthropology, Univ. of Denver,* 72 p., 75 c. A vivid and comprehensive report of petroglyphs studied and copied at 20 sites. Prof. Renaud finds that in the Pueblo area these art works are more thickly grouped than in the Western Plains. The Southwest pictures are more religious in symbolism, apparently, than Plains art of this type.

Science News Letter, June 24, 1939

History

AMERICA IN MIDPASSAGE—Charles A. Beard and Mary R. Beard—*Macmillan,* 977 p., $3.50. Pertinent, important and interesting history of the immediate past of our nation by a great team of historians. The chapter on "Science in the Widening Outlook" puts science progress of the past decade in enlightening perspective.

Science News Letter, June 24, 1939

Physics

EXPERIENCES IN PHYSICS — Lester R. Williard and Charles S. Winter—*Ginn,* 662 p., $1.92. The authors attempt an entirely different approach to physics for high school students, presenting only the fundamental subject matter free from obscure considerations of theory and difficult and impractical problems.

Science News Letter, June 24, 1939

Mathematics

ESSENTIALS OF ANALYTIC GEOMETRY—Raymond W. Brink—*Appleton-Century,* 233 p., $2.25. Here are the essentials of this subject, which are required for courses in calculus and other more advanced mathematics.

Science News Letter, June 24, 1939

Engineering

TOOL MAKING—C. B. Cole—*American Technical Society,* 413 p., $3.50. A textbook for use in technical training schools for tool makers.

Science News Letter, June 24, 1939

Physics

THE FUNDAMENTALS OF ELECTRO-MAGNETISM — E. Geoffrey Cullwick — *Cambridge (Macmillan),* 352 p., $4.50. A new textbook of British origin suitable for advanced undergraduate students. It is particularly designed for future electrical engineers.

Science News Letter, June 24, 1939

General Science

EXPLORING THE WORLD OF SCIENCE—Charles H. Lake, Henry P. Harley and Louis E. Welton—*Silver Burdett Co.,* 710 p., $1.80. A high school textbook covering the fields of meteorology, sound, weather, the universe, oil, building materials and the forces of matter and also topics of equal interest in other fields.

Science News Letter, June 24, 1939

Mathematics

MATHEMATICAL ADVENTURES—Fletcher Durell—*Bruce Humphries,* 157 p., $2. This little book is a collection of articles on the teaching of mathematics which the author has written for educational journals during the past 10 years.

Science News Letter, June 24, 1939